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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,113	12/22/2003	Kyung Yun Jung	SUN-DA-114T	8491
23557 7590 05/25/2007 SALIWANCHIK LLOYD & SALIWANCHIK A PROFESSIONAL ASSOCIATION PO BOX 142950 GAINESVILLE, FL 32614-2950			EXAMINER MONDT, JOHANNES P	
			ART UNIT 3663	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/743,113

Applicant(s)

JUNG, KYUNG YUN

Examiner

Johannes P. Mondt

Art Unit

3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

Amendment filed 3/1/07 forms the basis for this office action. In said amendment applicant substantially amended all pending claims 1-3 through substantial amendment of the independent claims 1 and 3.

Comments on "Remarks" submitted with said amendment are included below under "Response to Arguments".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. **Claims 1 and 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tung et al (5,248,632) in view of Man (5,533,635).

On claim 1: Tung et al teach (Figure 4, also Figure 9) a semiconductor device (col. 1, l. 5-8 and col. 3, l. 11-20), comprising:

a capacitor having a bottom electrode (MOS transistor channel including drain 20: see col. 3, l. 11-20 and realizing that a MOS transistor is also a MOS capacitor (see, e.g., S. Wolf, "Silicon Processing for the VLSI Era", Volume 3 – "The submicron MOSFET", pages 83-85), a dielectric layer 16 formed on the bottom electrode (col. 3, l.

Art Unit: 3663

30), and an upper electrode 18 (loc.cit.) formed on the dielectric layer, the capacitor being formed on a semiconductor substrate (12, 14 or 12/14: col. 3, l. 22-39);

a first insulating layer 22 (col. 3, l. 32-33) formed on the semiconductor substrate to cover the capacitor;

a plurality of first contact plugs (28 (col. 3, l. 41) and another not shown in the Figures)(col. 3, l. 35-39) (N.B.: see Fig. 10 and discussion: note that a plurality of devices as depicted in either Figure 4 or Figure 9 are integrated (col. 1, l. 5-9) formed in a plurality of first via holes of the first insulating layer, each of the plurality of said first contact plugs being electrically connected to either the bottom electrode or the upper electrode, namely the bottom electrode through drain 20(col. 3, l. 35-39));

a first metal wiring formed on the insulating layer and connected to the bottom electrode through one of the first contact plugs is inherent given the "contact regions 24 are formed *through* the thick oxide layer to provide contact to"... "the diffused regions" col. 3, l. 35-39), because in order for contact regions 24 (Figure 1) are thereby admitted to have an electrical connection to a conductive material positioned *on* said insulating layer;

a second insulating layer 30 (col. 3, l. 55-59 and Figure 4) or 48 (col. 5, l. 20-21 and Figure 9) formed on the first insulating layer;

a second contact plug 34 or 46 (Figures 4 and 9, resp.: see col. 3, l. 60 – col. 4, l. 3, and col. 5, l. 5-17) in the second insulating layer formed on the first insulating layer and connected to the upper electrode 18 through another one of the first contact plugs(namely: 28 taking into account the conductive nature of TiW layer 26 (col. 3, l. 47-48));

an anti-fuse 42 with anti-fuse element 36 (col. 3, l. 60 – col. 4, l. 15: Figure 4) or anti-fuse 56 with anti-fuse element 50 (Figure 9 and col. 5, l. 30-46) formed on the second contact plug 34 or 46 (Figures 4, 9 resp.) in a second via hole of the second insulating layer (30 or 48) and electrically connected to the second contact plug (loc.cit.); and

a third contact plug 40a or 54a (col. 4, l. 16-27 and col. 5, l. 18-29) filling the second via hole and formed within the anti-fuse (loc.cit.); and

a second metal wiring 60 formed on the second insulating layer (connecting to 40 must be on said second insulating layer 30 or 48: see Figures 4 and 9) (col. 5, l. 47-61 with Figure 10).

Tung et al do not necessarily teach the limitation "third contact plug does not directly contact the second insulating layer".

However, it would have been obvious to include said limitation in view of Man, who, in a patent on a MOS transistor (col. 2, l. 56 – col. 3, l. 35 and Figure 3) with Al comprising interconnect (see title, abstract and col. 2, l. 62-63), hence analogous art, teach the interposing of a TiW barrier metal layer 34 (col. 2, l. 61-62) between said interconnect 36 and the underlying dielectric layer 24 col. 2, l. 61).

Motivation to include the teaching of the interposition of a TiW metal barrier layer between dielectric layer 30 and Al-comprising metal layer 40a derives at least from the presence of Al also in the third contact plug by Tung et al (see col. 4, l. 19-27 in Tung et al), implying the desirability to keep the Al in 36 away from the dielectric material of 24, and the suggestion by Tung et al themselves to also include TiW in the material

Art Unit: 3663

embodiment of element 40. It would have been particularly obvious, in light of this suggestion by Tung et al, to include the teaching by Man in the form of a barrier layer of TiW separating a third contact plug comprising Al and dielectric 30 (i.e., the claimed second insulating layer) from the underlying "second insulating layer" 30. Note that all that is needed from Man is a modification in the teaching by Tung et al so as to teach a third contact plug comprising an aluminum copper compound separated from 30 by a TiW barrier layer, rather than the teaching by Tung et al "an aluminum copper compound and TiW".

Combination of the teaching by Man with the invention by Tung et al immediately meets limitation (a) through re-definition of the third contact plug as the aluminum copper compound portion of element 40a.

On claim 3: The device of claim 1 would necessarily have to be formed in order to function. Claim 3 fails to further limit the device of claim 1 other than simply form each of their components.

2. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tung et al and Man as applied to claim 1 above, and further in view of Madan et al (6,141,240).

As detailed above, claim 1 is unpatentable over Tung et al in view of Man. Neither references necessarily teach the further limitation defined by claim 2.

However, it would have been obvious to include said further limitation in view of Madan et al, who, in a patent on a memory array, teach the bitline (i.e., drain) and wordline (i.e., gate) wirings to be perpendicular to each other (Figure 1 and col. 3, l. 38-

43). *Motivation* to include said teaching by Madan et al in the invention by Tung et al at least derives from the spatial efficiency achieved by the cubic arrangement.

Response to Arguments

Applicant's arguments filed 3/1/07 have been fully considered but they are not persuasive. The claim language has, through substantial amendment, overcome the rejections in the previous office action for the reasons stated in said Remarks. However, after an update search necessitated by said amendment, it was found that new rejections must be provided for the new claim language (see rejections under 35 USC 103(a) overleaf).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 3663

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JPM
May 17, 2007

Primary Patent Examiner:


Johannes Mondt (TC3600, Art Unit: 3663)